

**United States Patent** [19]  
**Spinosa et al.**

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[54] **RETAINING CATHETER**

[75] Inventors: **Dom Spinosa, Wantagh; Phyllis Riely, Northport; Fred Hodgson, Centereach, all of N.Y.**

[73] Assignee: **East/West Medical Products, Inc., Syossett, N.Y.**

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[52] U.S. Cl. .... **128/349 R, 128/350 R**

[51] Int. Cl. .... **A61m 25/00**

[58] Field of Search..... **128/348, 349 R, 350 R, 128/351, 343**

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*Primary Examiner*—Dalton L. Truluck

[57] **ABSTRACT**

A retaining catheter formed of an inert fluorocarbon polymer and including means in the region of the end thereof for retaining said catheter within the body channel in the form of a helical thread projecting radially from the outer surface of the catheter.

**5 Claims, 10 Drawing Figures**

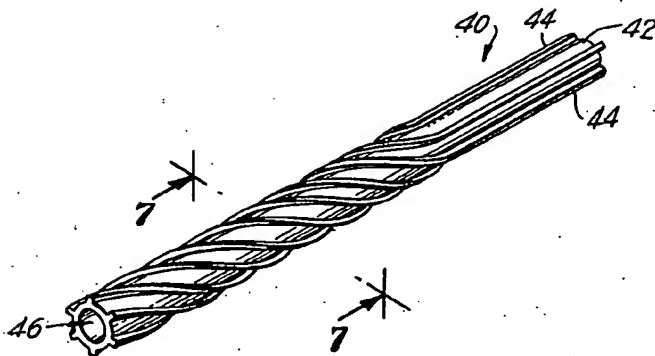


FIG. 1

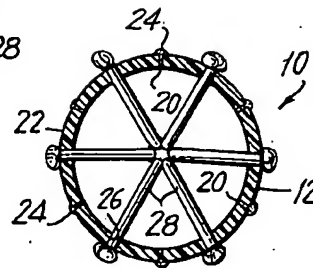
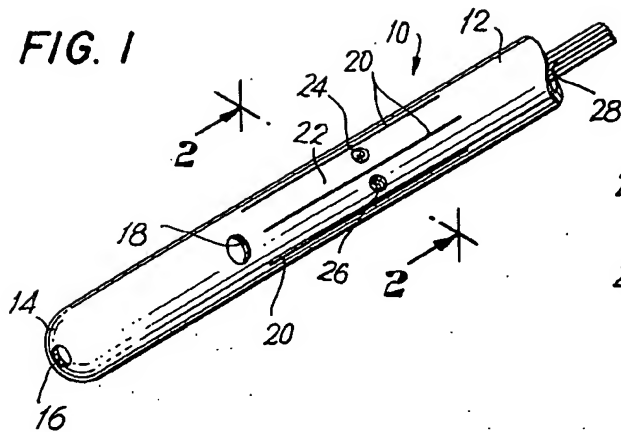


FIG. 2

FIG. 3

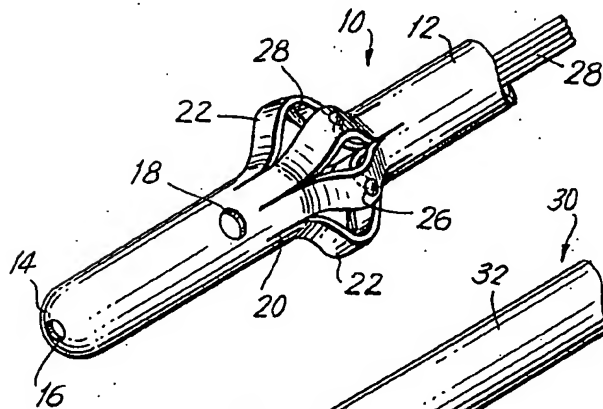


FIG. 4

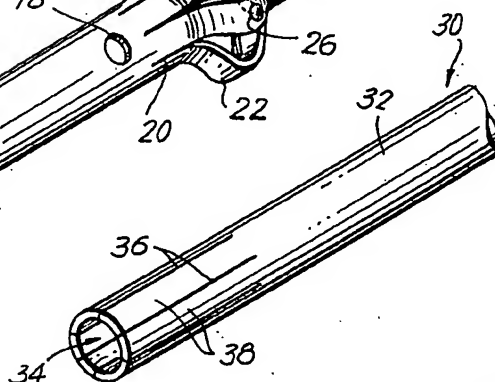
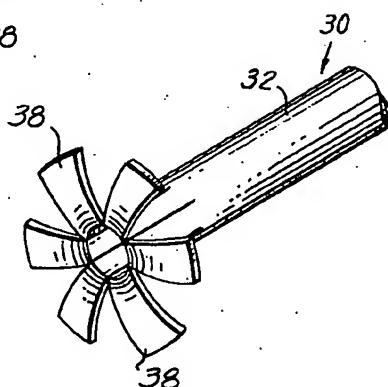
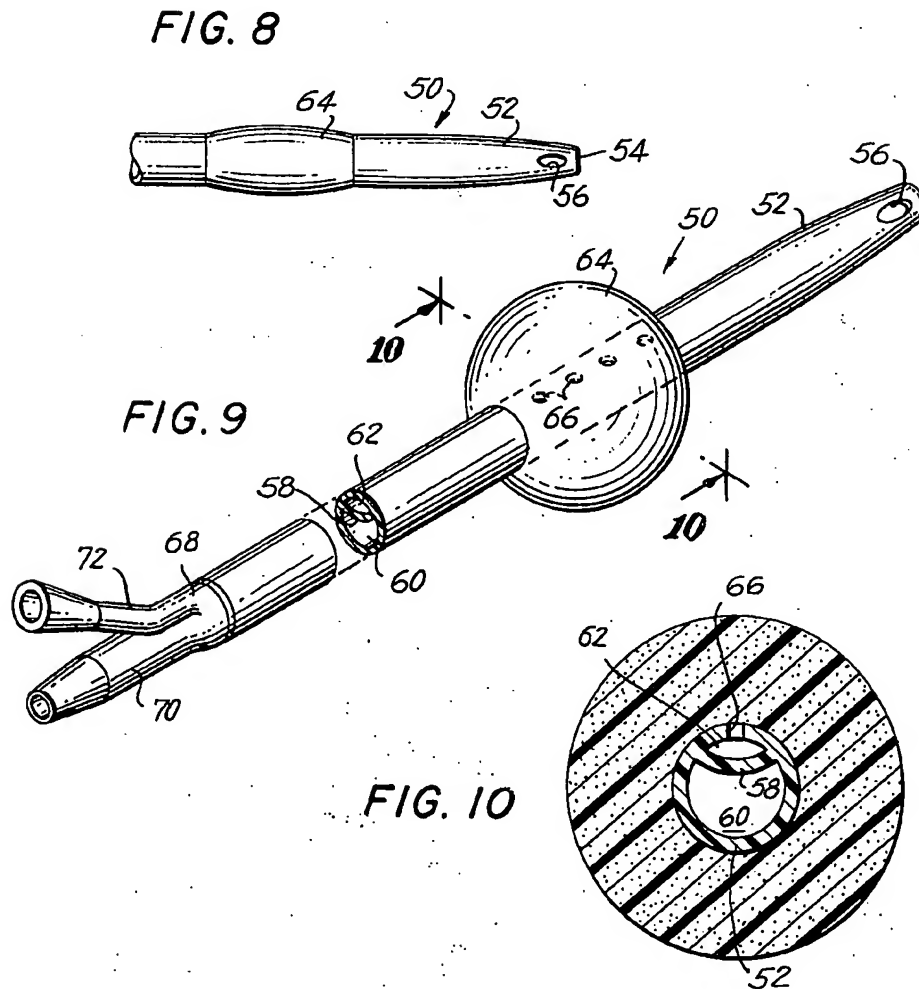
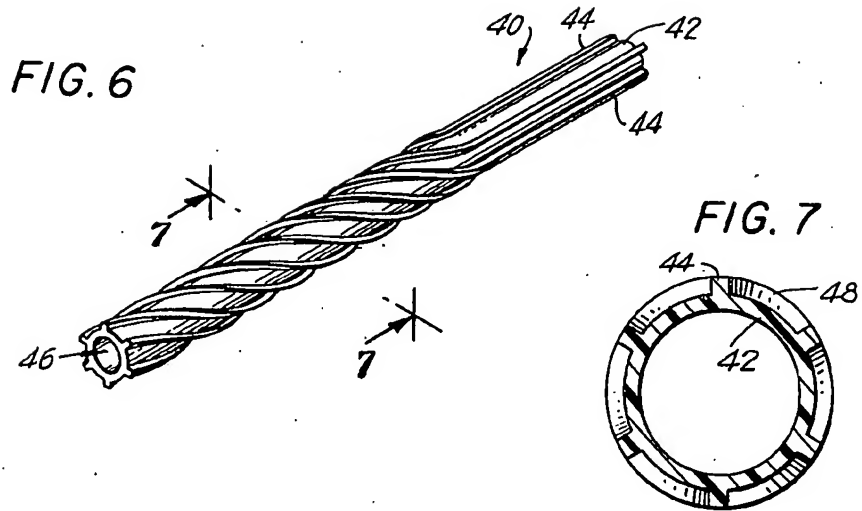


FIG. 5





## RETAINING CATHETER

## BACKGROUND OF THE INVENTION

This invention relates to catheters utilized in medical treatment as fluid pathways from or into the body. In particular, this invention relates to urinary catheters. Such catheters have proved difficult to insert, difficult to retain and difficult to remove. Further, the maintenance of an open fluid pathway while avoiding infection and irritation of body tissue has proved difficult. The majority of such catheters are formed of natural rubber, which contains many impurities which tend to cause tissue reaction during use. On the other hand, the plastics which have been utilized to date have proved too stiff, and cause problems during insertion. One prior art retention device, the Foley catheter, utilizes a rubber balloon which is inflated, but such balloons have caused problems in inflation and deflation, and the manufacture thereof has resulted in a high rate of rejection.

Particularly in the case of urinary catheters, the urine tends to react with the commonly used catheter materials, rough spots within the catheter providing nidus for crystallization and occlusion of the catheter drainage channel.

The retaining catheter constructions in accordance with the invention avoids the foregoing deficiencies.

## SUMMARY OF THE INVENTION

Generally speaking, in accordance with the invention, a retaining catheter is provided formed from a flexible material and including means adjacent the end of said catheter for retaining said catheter within the body channel. Said retaining means may include normally laterally projecting portions of the catheter wall and water soluble adhesive for retaining said normally projecting portions in a recessed position during insertion of said catheter, said laterally projecting portions being released after insertion due to the action of body fluid on said adhesive to retain said catheter in place. String means may be provided connected to each projecting portion and extending through the interior of said catheter for displacing said projecting portions to said recessed position to permit withdrawal of said catheter.

In another embodiment, said retaining means includes a helical thread laterally projecting from the surface of said catheter. In still another embodiment of the catheter in accordance with the invention, said retaining means includes a collar secured to the outer surface of said catheter and formed of foam material adapted to swell when exposed to aqueous liquid. A water soluble film may be provided about said foam collar, which film dissolves after insertion to permit swelling of said collar for retention within the body channel. Said catheter may be provided with first and second channels, the wall of said catheter being provided with openings in the region of said collar providing access to a first of said channels to permit evacuation of liquid retained within said foam collar to cause at least the partial collapse thereof for removal of said catheter from the body channel.

Accordingly, it is an object of this invention to provide a retention catheter which can be readily inserted and removed from the body channel, and which will be retained in place once inserted.

A further object of the invention is to provide a catheter which will maintain an open fluid pathway while avoiding infection and irritation to body tissue.

Still other objects and advantages of the invention will in part be obvious and will in part be apparent from the specification and drawings.

The invention accordingly comprises the features of construction, combinations of elements, and arrangement of parts which will be exemplified in the constructions hereinafter set forth, and the scope of the invention will be indicated in the claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the invention, reference is had to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a perspective view of the end of a first embodiment of a retention catheter in accordance with the invention;

FIG. 2 is a sectional view taken along lines 2-2 of FIG. 1;

FIG. 3 is a perspective view of the catheter of FIG. 1 disposed as it would be after insertion in the body channel;

FIG. 4 is a perspective view of the end of a second embodiment of a retention catheter in accordance with the invention;

FIG. 5 is a perspective view of the embodiment of FIG. 4 disposed as it would be after insertion in a body channel;

FIG. 6 is a perspective view of a third embodiment of a retention catheter in accordance with the invention;

FIG. 7 is a sectional view taken along lines 7-7 of FIG. 6;

FIG. 8 is a top plan view of the end of a fourth embodiment of a retention catheter in accordance with the invention;

FIG. 9 is a perspective view of the retention catheter of FIG. 8 disposed as it would be after insertion; and

FIG. 10 is a sectional view taken along lines 10-10 of FIG. 9.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1-3, the catheter 10 depicted consists of a tubular body 12 having a dome-shaped end 14 formed with an aperture 16 therethrough for the receipt and delivery of fluids. Further apertures 18, one of which is depicted in FIG. 1, are circumferentially spaced about the wall of body 12 in the region of dome 14. Catheter 10 is formed of a material which is flexible, hydrophobic, has a very smooth surface which discourages crystallization, a low coefficient of friction for easy insertion. The material may be characterized by a wave effect such that when the material is pinched, debris thereagainst are dislodged. A material meeting these criteria is an inert fluorocarbon polymer, such as the expanded PTFE material sold under the trademark GORTEX and manufactured by W. L. Gore & Associates, Inc. of Newark, Delaware.

A region of body 12 spaced from end 14 has been slit in a longitudinal direction along line 20 to define a plurality of longitudinally extending strips 22. Strips 22 have been pretreated, as by ultrasonics, to a natural, laterally projecting position depicted in FIG. 3. In other words, strips 22 have a memory of the shape depicted

in FIG. 3 and return to that shape if distorted and released. Strips 22 are retained in the recessed position of FIG. 1, at which they are substantially aligned with the surface of body 12, by means of a water soluble adhesive 24 such as PVA. Said water soluble adhesive dissolves after the catheter is inserted in the body channel due to the action of the body fluid to release strips 22 which assume their normal position as depicted in FIG. 3. Said strips, when in the position of FIG. 3, serve to retain the catheter within the body channel. Each of the strips 22 is formed with an aperture 26 therethrough. The knotted end of one of the lengths of string 28 which extend through the interior of catheter 10 passes through aperture 26 and is retained thereat, as more particularly shown in FIG. 2. Strings 28 extend through the fluid carrying channel within catheter 10 to the exterior of the body and are provided to permit the displacement of strips 22 from the position depicted in FIG. 3 to the recessed position to permit withdrawal of the catheter. Such displacement is achieved by merely drawing on the strings 28 from outside the body.

A second embodiment 30 of the catheter in accordance with the invention is depicted in FIGS. 4-5. The embodiment of FIGS. 4-5 is also provided with a tubular body portion 32 but terminates in an open end 34. The region of the open end of body 32 is formed with longitudinal slits along lines 36 to define petal-like strips 38 secured together by water soluble adhesive in the same manner as the strips 22 of the embodiment of FIGS. 1-3. Strips 22 are also pre-treated to have a memory, so that after insertion in the body, the strips 38 are released as depicted in FIG. 5 to provide retention means for the catheter. If desired, string similar to strings 28 may be secured to the ends of each of petals 38 to provide means for bringing said petals back to a recessed position to ease withdrawal of the catheter.

A third embodiment 40 of the retention catheter in accordance with the invention is depicted in FIGS. 6 and 7. This embodiment consists of a tubular body 42 formed with a plurality of longitudinally extending radial flanges 44. The end of tubular body 42 is defined by an opening 46 and the region of said body adjacent said opening has been twisted and prehardened to define a helically threaded region. Said helically threaded region cooperates with the wall of the body channel to permit easy insertion and removal of the catheter and further cooperates with said wall to retain the catheter within the body channel. A dome-shaped apertured cap may be formed on the end of said body portion.

The embodiment of FIGS. 6 and 7 provides a minimum contact between the walls of the catheter and the body channel. Further, the channels 48 defined between flanges 44 permit the drainage of exudate discharge from the prostatic gland in urinary application, thereby eliminating the pain and swelling frequently associated with urinary catheterization.

A fourth embodiment 50 of the retention catheter in accordance with the invention is depicted in FIGS. 8-10. As in the other embodiments, the catheter is formed with a tubular body 52 having an opening 54 at the end thereof and openings 56 in the region adjacent end opening 54. As best shown in FIGS. 9 and 10, the catheter 50 is formed with an inner partition 58 which defines a main fluid channel 60 and an evacuation channel 62 within tubular body 50. A collar 64 is secured about body 50 in a region spaced a short distance

from end aperture 54. Said collar is formed of a foam material adapted to swell greatly when exposed to an aqueous liquid and to retain said liquid therein. One such material a hydrophilic polyurethane foam such as the material sold under the trademark HYDRO-FOAM manufactured by Scott Paper Company, Foam Division of Chester, Pennsylvania. When substantially dry, such foam assumes a low profile as depicted in FIG. 8. When exposed to body fluids, the foam swells to assume the enlarged profile depicted in FIGS. 9 and 10. In order to avoid premature swelling, the foam is preferably coated with a water soluble film formed of a material such as PVA which dissolves after insertion and exposure to body fluid for a short period of time.

The wall of tubular body 52 is formed with a number of apertures 66 therethrough in registration with evacuation channel 62. As depicted in FIG. 9, the end of catheter 50 projecting outside of the body channel is formed with a dual fitting 68 having a main branch 70 operatively coupled to fluid channel 60 and a secondary branch 72 operatively coupled to evacuation channel 62. Secondary branch 72 would be connected to a vacuum pump when the catheter 50 is to be removed from the body channel. Said vacuum pump would draw the fluid from foam collar 64 through aperture 66 and evacuation channel 62, to collapse said collar substantially to the recessed position depicted in FIG. 8 to permit the easy withdrawal of the catheter.

The catheters of the embodiments of FIGS. 4-10 are all preferably formed of the material described in connection with FIGS. 1-3. All of said embodiments are characterized by ease of insertion and removal, while providing means for retention within the body channel during use.

It will thus be seen that the objects set forth above, and those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above constructions without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

What is claimed is:

1. A retention catheter for insertion in a body channel comprising a tubular body formed from a smooth, flexible, inert, hydrophobic material having a low coefficient of friction, and a plurality of closely spaced ribs extending along the exterior of the tubular body for a length at least equal to the length of the body channel, the ribs defining narrow passages therebetween for fluid drainage flow along the exterior surface of the tubular body, the ribs being sufficiently high and sufficiently closely spaced to hold the body channel surface away from the passages and keep the passages open after insertion of the tubular body in the body channel, the ribs extending helically along the exterior surface only adjacent the inserted end, and extending longitudinally and in parallel thence over the remaining portion of the catheter.

2. A retention catheter as recited in claim 1, wherein said tubular body is formed with the ribs integral therewith.

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3. A retention catheter as recited in claim 1, wherein said tubular body material is an inert fluorocarbon polymer.

4. A retention catheter as recited in claim 3, wherein

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said material is polytetrafluoroethylene.

5. A retention catheter as recited in claim 4, wherein the material is foamed polytetrafluoroethylene.

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